



**TETRA TECH**

## **Final Remediation Report**

### **Wolcott Street Acid Sludge Remediation Project**

### **Former Lobell Refinery Orphan Site 57.004 Casper, Wyoming**

*Prepared for:*

#### **Wyoming Department of Environmental Quality Solid and Hazardous Waste Division Orphan Site Remediation Program**

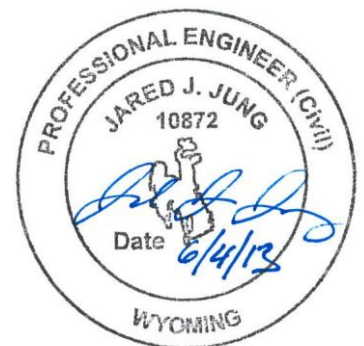
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June 4, 2013



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## 1.0 INTRODUCTION

Tetra Tech was retained by the Wyoming Department of Environmental Quality (Wyoming DEQ) to conduct remediation at the former Lobell Refinery of waste materials (i.e., acidic petroleum sludge-like material) and impacted soil under a specified portion of South Wolcott Street and, as necessary, limited areas of sidewalk directly adjacent to 334 South Wolcott Street located in downtown Casper, Wyoming (Site). Performance of the remediation project was completed in accordance with the remedial alternative selected by the Wyoming DEQ under the Orphan Site Remediation Program (OSRP) and as directed by Wyoming DEQ during remediation activities.

This Final Remediation Report provides a brief description and environmental history of the subject Site, a summary of the excavation and remediation activities, photo-documentation of remedial activities (Appendix I), daily field notes that documented project activities (Appendix II), a summary of the excavation confirmation sample analytical data obtained from the limits of the excavation, and an interpretation of the confirmation analytical results with respect to Wyoming DEQ's remedial objectives. The purpose of this project was to conduct remediation of acidic and hydrocarbon impacted waste and soil (acidic waste/soil) under the street and limited areas of sidewalk directly adjacent to 334 South Wolcott Street in order to minimize possible human exposure to the acidic waste/soil migrating to the street surface.

The Wyoming DEQ OSRP preferred remedial alternative was excavation of waste materials and impacted soil, followed by on-site neutralization and off-site disposal of the treated waste/soil as petroleum contaminated soil (PCS).

### 1.1 Site Description

The Wolcott Street Site is located in downtown Casper, Natrona County, Wyoming, within the 1.2 acre area of the former Lobell Refinery Orphan Site 57.004. The remedial area defined by Wyoming DEQ extended approximately 55 feet across South Wolcott Street and approximately 170 feet north from East Collins Drive towards the Rails to Trails pathway and included limited areas of the sidewalk directly adjacent to 334 South Wolcott Street. The location of the Site is presented in Figure 1 (Site Location Map).

### 1.2 Background

The former Lobell Refinery site was first developed for industrial use in the late 1800s. Pennsylvania Oil and Gas Company built and operated a petroleum refinery on the site from 1895 to 1903. The refinery was then purchased by Lobell, who operated it from 1903 until 1911.

Historical records show that from 1911 to present time, the former Lobell Refinery site was owned and/or occupied by several different owner/operators, including but not limited to Midwest Refining Company, Stanolind Oil and Gas Company, Standard Oil Company, Chicago Northwestern Railway Company, and the Goodstein Property Trust. An electricity generation plant was once present adjacent to the northwest corner of the site and was fueled first by coal and later by fuel oil. Northern Utilities also operated a warehouse located along the southern edge of the property.

Sanborn maps from 1903 and 1907 show the presence of various oil tanks and an acid storage area within or near present day South Wolcott Street. Historical documents show there was an open oil storage pit located on the Site, which was later filled in by the City of Casper because it was considered a public health hazard. None of the historic maps showed the specific location of the oil storage pit. The former pit is a potential source of the surficial hydrocarbon seeps discovered along South Wolcott Street. Historical maps and records also indicate a railroad siding was located along the north side of East Collins Drive, which was reportedly removed between 1961 and 1967. The railroad track located along the north edge of the South Wolcott Street Site is now a pathway as part of the “Rails to Trails” initiative to convert former railways into recreation areas. The former railroad tracks and historic activities associated with loading and unloading rail cars are also a potential source of Site contamination.



Sheffner-McFadden Collection, Casper College Western History Center

Oil Refinery – Casper, Wyoming and Freight outfits for Company. Photo by W. G. Passmore

### **1.2.1 Summary of Previous Environmental Reports**

Several site assessments and limited environmental site investigations have been performed since 1995 to characterize the contamination in the area of the former Lobell Refinery, which incorporates the boundaries of the Wolcott Street project remedial area. The environmental studies conducted at the former Lobell Refinery have included projects completed under the direction of Wyoming DEQ, United States Environmental Protection Agency (USEPA), and private entities. These investigations are briefly summarized below.

- In 1995, two railroad tank car underground storage tanks beneath the northwest portion of the Site, at 421 S. Center Street, were emptied, cleaned, and abandoned in place under the Wyoming Underground Storage Tank Program, Facility No. 4176.
- In 1997 URS on behalf of the USEPA investigated reports of seeps of viscous liquids rising to the ground surface through cracks in the sidewalks at the Site. Eight polynuclear aromatic hydrocarbon (PAH) compounds were detected at the Site. A report from URS Operating Services, Inc. (Denver, CO), entitled, "*November 1997: Analytical Results Report for Focused Site Inspection, J.H. Lobell Refinery Site, Casper, Wyoming, CERCLIS ID# WY0001654391*," was submitted to EPA Region VIII under Contract No. 68-W5-0031.
- A limited environmental site assessment was conducted in 2003 by Inberg Miller Engineers (IME) on behalf of the Goodstein Property Trust (VRP Site #2043). The report, entitled "*Subsurface Exploration Service, 421 South Center Street Property, Casper Wyoming*," reported the presence of total petroleum hydrocarbon diesel range organics (TPH-DRO) in both shallow and deep soils in the eastern portions of the Site.
- In 2004, an additional site assessment was performed by Gene R. George & Associates, Inc. (GRGA) on behalf of the Goodstein Property Trust (VRP Site #2043). Activities included subsurface soil borings. Results confirmed the occurrence of weathered TPH-DRO in concentrations above the Wyoming DEQ Voluntary Remediation Program soil cleanup levels (2,410 mg/kg to 8,200 mg/kg) in the site soils. The source of the weathered hydrocarbons was attributed to the former refinery operations from over 100 years ago.
- Limited site characterization studies were conducted for the Wyoming DEQ/OSRP at the site by Tetra Tech in 2010 and 2011 and included subsurface soil sampling, direct push borings, ground penetrating radar testing, test pit sampling, and assessment of the surface and subsurface acidic hydrocarbon seep material at South Wolcott Street. Data collected was used to assess the vertical distribution of contamination in proximity to potential source areas. Measurable concentrations of PAH and TPH-DRO in the subsurface soil samples were detected. Analyses of the acidic hydrocarbon seep material showed concentrations of TPH-DRO and a pH range of 0.85 to 1.16 s.u. The results of the direct push soil boring investigation showed that the acidic hydrocarbon waste migrated upward along preferential pathways, but did not reveal the location of a single source area.

### 1.3 Existing and Planned Site Use

The Site is currently a public street and right-of-way maintained by the City of Casper with sidewalks and adjacent commercial properties on each side of South Wolcott Street. It is expected that the Site will continue to be used as a City maintained public street and right-of-way and commercial use will continue at the adjacent properties.

## 2.0 REMEDY SELECTION

The remedial alternative for the Site was selected by the Wyoming DEQ Orphan Site Remediation Program (OSRP) from the options presented in the *Wolcott Street Seeps Remedial Alternatives Report* (Option 3, Tetra Tech, June 1, 2011). The selected alternative for remediation of the portion Wolcott Street “seeps” area associated with the former Lobell Refinery was excavation of the acidic hydrocarbon waste material and impacted soil (acidic waste/soil), followed by on-site neutralization and off-site disposal as petroleum contaminated soil (PCS).

### 2.1 Remediation Goals

The remedial goal was to remove the source of acidic hydrocarbon seeps that has migrated to the South Wolcott Street surface, especially during the warmer summer months. The purpose of remediation was to eliminate the surface exposure pathway for the seeps from becoming active and exposing the public to the acidic hydrocarbon seep material.

Wyoming DEQ’s project clean-up goals were pH greater than 5.0 standard units (s.u.) and total petroleum diesel range organic (TPH-DRO) concentrations of less than 2,300 milligrams per kilograms.

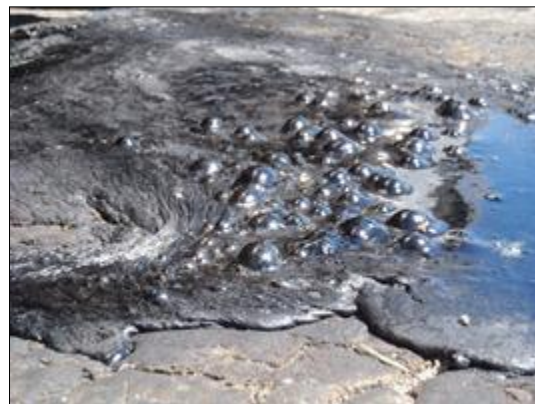
### 2.2 Remediation Objectives

The purpose of this Final Remediation Report is to document that the remediation activities conducted at the Site were completed in accordance with the remedial alternative selected by Wyoming DEQ, Orphan Site Remediation Program (OSRP), and as directed by Wyoming DEQ during remediation activities.

The Site remediation goal was to remove the source of acidic hydrocarbon seeps migrating to the South Wolcott Street surface in order to eliminate the primary exposure pathway (dermal contact). A Site location map is presented as Figure 1.



Large seep observed over Century Link line



Seep observed on east side of Wolcott Street

## 2.3 Scope of Remediation Project

The excavation and on-site remediation of impacted acidic waste/soil was completed as described in the Wolcott Street Remediation Work Plan prepared by Tetra Tech and in accordance with on-site direction provided by Wyoming DEQ. Project initiation, oversight, guidance, funding, and stakeholder involvement and coordination were provided by the Wyoming DEQ OSRP. On-site project management and contract administration was performed by Tetra Tech in coordination with the Wyoming DEQ project manager.

A Tetra Tech environmental scientist was on-site full time during the remediation work to observe and document the excavation and remedial activities, monitor waste treatment activities, oversee subcontractor performance, administer on-site health and safety requirements, act as emergency coordinator, and to collect soil verification and confirmation samples for analyses.

Fuel Management Solutions, LLC (FMS), was retained by Tetra Tech as the prime excavation subcontractor. In addition, Tetra Tech contracted with Pace Analytical Services for laboratory analytical services and JKC Engineering for surveying services during restoration.

FMS was tasked with site security, traffic control, pavement removal, excavation, application of the neutralizing agent for waste treatment, waste hauling, and restoration activities. FMS subcontracted with the following firms to perform the specified activities:

- Keyhole Traffic Control for traffic control design and plan preparation, set-up, and management;
- Wayne Coleman Construction Inc. for security fence installation, street pavement removal, backfilling and site restoration;
- Badger Daylighting for hydrovac excavation for replacement of Joshua's Storehouse water service line;
- Huber Plumbing for sewer line locates and installation of the replacement water service line at Joshua's Storehouse; and
- Ramshorn Construction, Inc. for sidewalk and curb and gutter replacement.

The following activities were completed for the remediation project:

- A remediation pilot test was conducted April 23 through April 27, 2012, to determine the most effective neutralizing agent and the optimal operating parameters for the full scale remediation process.
- Wyoming DEQ, supported by Tetra Tech, held meetings with stakeholders on June 29, 2012, to respond to questions, coordinate project logistics, and discuss communication methods during remediation implementation.
- Tetra Tech developed outreach/educational materials for public distribution and participated in a public meeting held on July 19, 2012.
- Obtained appropriate permits and an approved traffic control plan from the City of Casper, completed utility locates, and installed traffic and pedestrian controls.

- Installed security fencing and access controls around the remedial area and delineated the project site exclusion zone, truck/equipment loading/unloading area, and support zone.
- Photo-documented the existing pre-construction site conditions and conducted a preliminary assessment of observable structural damage (i.e., cracks in walls, evidence of building movement) of Joshua's Storehouse structure prior to construction commencement.
- Removed approximately 9,300 square feet of asphalt/concrete road surface and 668 square feet of sidewalk to expose the acidic waste/soil in the remedial area.
- Transported excavated asphalt/concrete pavement rubble to Wayne Coleman Construction for reprocessing and reuse in construction projects.
- After pavement removal, conducted a preliminary assessment of the distribution of acidic waste/soil by visual examination of the remedial area.
- Excavated 835 cubic yards of acidic waste/soil and native soil from the remedial area and transferred to the treatment area or non-impacted native soil stockpile.
- Performed on-site treatment by neutralization via application of cement kiln dust.
- Conducted verification sampling and laboratory analyses to document the neutralized waste/soil met Casper Regional Landfill disposal criteria.
- Transported 1,095.51 tons of neutralized waste/soil to the Casper Regional Landfill for off-site disposal as petroleum contaminated soil (PCS).
- Coordinated with Wyoming DEQ and Century Link (communications utility owner) to safely excavate to the top of the north/south fiber optics line.
- Coordinated with Wyoming DEQ and Source Gas (gas line utility owner) to excavate and expose the gas main and tap.
- Coordinated with Wyoming DEQ and the City of Casper to replace a portion of the water service line to Joshua's Storehouse.
- Coordinated with Wyoming DEQ to respond to unforeseen site conditions, as discussed below in Section 5.4.
- Collected 10 sidewall and 8 floor confirmation samples from the remedial excavation for laboratory analyses.
- Approximately 2 cubic yards of excavated waste and impacted miscellaneous debris, primarily old metal pipe and steel barrel bands, were containerized and transported off-site by PSC for disposal as hazardous waste at the Clean Harbors El Dorado Incineration Facility in El Dorado, Arkansas.

- Backfilled and compacted the excavated area to a depth of six inches below final subgrade and placed a six-inch layer of recycled concrete base course on the compacted backfill material in accordance with City of Casper requirements for subgrade preparation.
- Conducted construction material testing to confirm backfill and base course placement complied with City of Casper specifications.
- Survey grade staking was performed by JKC Engineering to ensure street contours complied with City of Casper street grading requirements.
- Sidewalks and curb and gutter removed during excavation activities were replaced and constructed in accordance with City of Casper specifications.
- At the request of Wyoming DEQ, asphalt patches were applied to old potholes in the Salvation Army parking lot.
- A final Site walkthrough was conducted by Wyoming DEQ, the City of Casper, Tetra Tech, and FMS. A punch list was generated and substantial completion was reached. All punch list items were completed and the Site was transferred back to the City of Casper.

The scope of work did not include repaving South Wolcott Street. The City of Casper was responsible for repaving South Wolcott Street.

## **3.0 PRE-REMEDATION ACTIVITIES**

### **3.1 Remediation Pilot Test**

A remediation pilot test was conducted April 23 through April 27, 2012, at the Tetra Tech facility in Casper, Wyoming. The purpose of the pilot test was to determine the most effective neutralizing agent for the acidic hydrocarbon waste/soil at the Site and to ascertain the optimal operating parameters for the on-site full scale remediation process.

Three cubic yards of representative acidic waste/soil were excavated from the Site for the pilot test. Three neutralization agents were evaluated for use in full scale treatment – fly ash, cement kiln dust (CKD), and precipitated calcium carbonate. Based on good mixing properties, rapid neutralization, and treatment efficacy, pilot test results showed the CKD was the most effective neutralization agent to reduce the acidity of the waste/soil to the target range of greater than pH 5.0 and less than pH 9.0 standard units (s.u.) using an application rate of  $\leq 5$  percent CKD by volume.

## 3.2 Project Documents

### 3.2.1 Remediation Work Plan

A Remediation Work Plan was prepared to describe the remedial activities to be conducted at the Site. It included detailed information for field activities that were to be conducted as part of the Site remediation project. The Remediation Work Plan addressed:

- Remediation pilot test;
- Community outreach;
- Pre-mobilization activities, including utility clearances and City of Casper permitting;
- Site setup, including Site security and access controls, traffic and pedestrian controls, storm water controls, delineation of exclusion, loading, and support zones;
- Remediation implementation, including pavement removal, acidic waste/soil excavation, remedial treatment, monitoring, verification and confirmation sampling, and transportation and disposal; and
- Site restoration and demobilization.

The Site was remediated in general accordance with the Remediation Work Plan. Any deviations from the Remediation Work Plan are noted below in Section 3.2.1.1.

#### 3.2.1.1 Deviations to the Remediation Work Plan

All deviations from the Remediation Work Plan were discussed with Wyoming DEQ on-site prior to implementing the proposed Work Plan modifications.

The Remediation Work Plan proposed an on-site neutralization treatment method that entailed loading the on-site treatment area with two lifts of excavated acidic waste soil approximately 8-inches thick with a layer of CKD sandwiched between the two layers, then blending the layers using the CAT RM-500 soil reclaimer. Due to the low volume of CKD required for acidic waste/soil neutralization, which averaged approximately 0.6% by volume, and the effective mixing properties of the CAT RM-500 reclaimer, it was determined that a single lift one to two feet high of a specified volume of acidic waste/soil (45 cubic yards) with even application of CKD over the surface was sufficient for adequate neutralization. Effective neutralization was confirmed by in situ pH readings collected at five-foot intervals along the length of the treatment area for each excavated volume of acidic waste/soil treated.

The Remediation Work Plan also proposed to utilize an agricultural drop spreader or equivalent type of solids spreading equipment equipped with a variable setting for the required CKD application rate. The drop spreader was to be towed over the acidic waste/soil layer in the treatment area using the skid steer or equivalent equipment. Due to the low volume of CKD required for acidic waste/soil neutralization, which averaged 0.6% by volume, a field evaluation determined that hand-application of CKD would be more efficient.

Unforeseen conditions encountered during excavation activities were not specified in the Remediation Work Plan, but were appropriately addressed as necessary in the field when they occurred, as discussed in Section 5.4 of this report.

### **3.2.2 Sampling and Analysis Plan (SAP)**

A Sampling and Analysis Plan (SAP) was prepared for the Wolcott Street Acid Sludge Remediation project and is attached as Appendix A to the Remediation Work Plan. The SAP described the sampling and analysis activities that were performed during implementation of the remediation project and was prepared in general accordance with VRP Fact Sheet #29, *Sampling and Analysis Plans*.

The SAP describes the methods for in situ waste/soil pH measurements, waste/soil sampling procedures, and laboratory analytical methods that were followed during the remediation project to ensure consistency of sample collection and the validity of the data. The following data was collected:

- In situ pH measurements were performed to: (1) identify and delineate the presence/absence of acidic waste/soil in the excavation; (2) determine the application rate of CKD to neutralize the acidic waste/soil during on-site treatment; and (3) verify the treated waste/soil met the target pH range for disposal at the Casper Regional Landfill.
- Verification sampling and laboratory analyses of the treated waste/soil were performed to provide documentation of the concentration of total petroleum hydrocarbon diesel range organics (TPH-DRO) and to verify the treated waste/soil passed the paint filter test criteria for disposal at the Casper Regional Landfill.
- Soil confirmation sampling and laboratory analyses were performed to document the conditions of the post-remedial excavation and to confirm that the remediation goals were met to the extent determined by Wyoming DEQ.

### **3.2.3 Quality Assurance Project Plan (QAPP)**

The quality assurance/quality control measures that were implemented during project execution are described in the Quality Assurance Project Plan (QAPP) included as Appendix B of the Remediation Work Plan. The QAPP assured that Site field and analytical data collected met the project Data Quality Objectives (DQOs).

Data quality objectives (DQOs) were pre-established goals that helped monitor and assess project progress. They provided benchmarks against which the quality of field work and the quality of the resultant analytical data were evaluated. For this project, DQOs were provided in the QAPP, which specified the type, quality, quantity, and uses of the data needed to adequately support project decisions.

The questions posed in the QAPP (Section 1.5.2, Decision Statement) to guide project decisions were answered during the course of project activities and are presented below.

- ***Does data collected from previous environmental investigations sufficiently delineate the lateral and vertical extent of the waste in the remedial area?***

No. The data collected from previous environmental investigations did not sufficiently delineate the lateral and vertical extent of the waste in the remedial area. The actual extent of waste in the remedial area was not defined either laterally or vertically prior to the start of remedial activities. During excavation, the waste was observed to extend beyond the remedial area boundaries toward the south, west beneath Joshua's Storehouse and the south parking area, and east toward the Ashley Furniture parking lot. Determining the extent of impacts during the site characterization investigations was primarily limited due to access restrictions and logistical concerns (e.g., presence of contamination under structures, private property, etc.).

- ***Does the occurrence of the waste and impacted soil extend beyond the remedial area defined by Wyoming DEQ?***

Yes. Waste/soil was observed to extend laterally in several areas toward the east, west, and south beyond the remedial area defined by Wyoming DEQ.

- ***Do visual inspections and in situ pH readings of the exposed waste/soil in the remedial area adequately identify the waste areas that require remediation?***

Yes. For the majority of the remedial area, acidic waste/soil that required treatment and removal was visually discernible, which appeared as black tarry seep material and gray to black stained soil. However, in some areas there were soils that appeared clean but in situ pH readings showed the soil was highly acidic and therefore required neutralization treatment and disposal. The combination of visual observations and in situ pH readings were generally adequate to identify the waste areas requiring treatment and disposal.

- ***What is the lateral extent of the area impacted by the waste/soil?***

The lateral extent of the area impacted by acidic waste/soil encompassed most of the remedial area defined by Wyoming DEQ and appeared to extend toward the east, south, and west boundaries outside the remedial area. During excavation, acidic waste/soil was observed in portions of the east, south, and west sidewalls. Further investigation/excavation would be necessary in order to determine the actual lateral extent of the area impacted by waste.

- ***What depth of excavation is required within the currently defined remedial area?***

Within the defined remedial area, the depth of excavation required to adequately remove the acidic waste/soil was generally zero to four feet, excluding the area adjacent to the gas main, where excavation depths were up to six feet.

- ***What is the impact if Wyoming DEQ determines waste/soil should be left in place in the remedial area?***

Due to logistical concerns, safety concerns, and other mitigating factors, Wyoming DEQ determined that certain areas of waste would remain in place. Although specific potential impacts from waste left in place cannot be determined without further investigation, based on the confirmation sampling and the extent of waste observed in the sidewalls and floor of the excavation, Wyoming DEQ concluded it is unlikely the remaining waste will cause an unacceptable surface exposure pathway to the public.

- ***Does the data collected demonstrate the remediation process meets the requirements for disposal at the Casper Landfill?***

Yes. The in situ pH readings of treated waste/soil and data collected from post-treatment stockpiles indicates the treated waste/soil delivered to the Casper Regional Landfill met the disposal criteria.

- ***Are backfill materials (non-impacted native soil and imported clean soil) used to replace excavated waste/soil suitable for placement in the excavation?***

Yes. The imported clean soil used for backfill in the excavation was recycled concrete provided by Wayne Coleman Construction. Tetra Tech performed gradation, Atterberg limits, and standard proctor analyses of a representative sample of the recycled concrete to be used for backfill. The results demonstrated that the material met the City of Casper specifications and was suitable for backfill at the Site. Only a small amount of non-impacted native soil was stockpiled during remedial activities. This material was used to build ramps in the excavation. All backfill materials were deemed suitable for these uses.

### **3.2.4 Health and Safety Plan (HASP)**

A site-specific health and safety plan (HASP) was prepared for the remediation project under the supervision of Tetra Tech's certified industrial hygienist. The site-specific HASP complied with current state-specific and federal Occupational Safety and Health Administration (OSHA) health and safety standards, including 29 CFR 1910, General Industry Standards, and 29 CFR 1926, Construction Industry Standards.

The HASP addressed the site-specific hazards and potential risks associated with known conditions of the remedial work area and identified the health and safety procedures necessary to ensure safe Site operations. The site-specific HASP was available on-site at all times for the duration of the remediation project.

During remediation and construction activities, the provisions of the HASP were mandatory for all Wyoming DEQ personnel and its contractors who were at the Site, as well as other authorized personnel (utility owners, City of Casper staff) that were allowed Site entry into the exclusion zone (work zone).

A Tetra Tech Site Safety Coordinator (SSC) was assigned to the project and present on-site at all times during work activities. The SSC was responsible for enforcing HASP requirements and safe work practices, conducting and documenting daily on-site safety meetings, controlling entry and exit at Site access control points, ensuring that appropriate personal protective equipment was used in designated areas, safely escorting visitors (i.e., personnel not performing field activities) into the exclusion zone, monitoring work parties for signs of stress (heat stress, fatigue), and maintaining the sign-in/sign-out log for anyone accessing the Site.

Prior to entering the Site, all personnel were required to review the HASP and sign the Tetra Tech Compliance Agreement Form to acknowledge they have read, understood, and would comply with the HASP. With the exception of construction personnel performing field work, all other parties were required to be escorted by the SSC or designee to access the work zone.

The SSC performed on-site safety briefings before each work day. These safety briefings addressed the scope of the HASP, current operations and conditions, known or potential hazards, precautions to prevent injuries, and other relevant site-specific topics. Additional on-site safety briefings were conducted as determined necessary by the SSC to address specific safety issues or discuss unanticipated site conditions.

All remedial work performed for the remediation project was in full compliance with governmental requirements, including Site and work safety requirements mandated by state and federal OSHA. Wyoming DEQ's contractor (Tetra Tech) and its subcontractors that performed field work in association with the remediation project abided by the HASP during all remediation activities.

### **3.2.5 Emergency Response Contingency Plan**

In addition to and in conjunction with the HASP, an Emergency Response Contingency Plan (Plan) was prepared that described the measures to be followed for emergency situations that could potentially occur during implementation of the remediation project activities. The Plan was developed in general accordance with 29 CFR 1910.38 (Emergency Action Plans) and in coordination with the City of Casper, Source Gas, and local emergency responder agencies.

The Plan was available on-site at all times during the remediation activities. All on-site personnel working on the Site, including subcontractors and other authorized personnel, were required to review the Plan in order to be familiar with, understand, and be prepared to carry out the defined emergency procedures. In addition, Joshua's Storehouse was provided with a copy of the Plan and was briefed each morning of the schedule of the planned project activities.

The Plan clearly defined the emergency procedures and protocol required to be followed in the event of an emergency. In addition to describing general emergency response procedures, the Plan provided emergency responses for potential events specifically related to remediation project activities. Specific emergency events addressed in the Plan included: rupture of the gas line with and without a fire or explosion; equipment fires; on-site worker injury or illness; and discovery of unforeseen chemicals during excavation.

The on-site Tetra Tech SSC was assigned as the acting "Emergency Response Coordinator" to ensure all Site personnel followed the emergency response protocols described in the Plan for Site emergency situations that could have occurred during construction and remedial activities.

No emergency situations occurred during the project construction and remedial activities.

## **3.3 Stakeholder Meeting and Public Outreach**

The Wyoming DEQ coordinated and led community relations throughout the course of the project. Tetra Tech supported the Wyoming DEQ community relation activities as necessary and as requested by Wyoming DEQ. Informational brochures for public distribution were prepared by Tetra Tech and approved by Wyoming DEQ. Community outreach materials are presented in Appendix III.

### **3.3.1 Stakeholder Meeting**

Two stakeholder meetings were conducted by Ms. Cindi Martinez, Wyoming DEQ project manager, with support provided by Tetra Tech and Fuel Management Solutions, on June 29, 2012. A draft version of the Remediation Work Plan was provided to each of the meeting invitees prior to the meeting. The purposes of the stakeholder meetings were to discuss the draft Remediation Work Plan and receive input from stakeholders regarding the planned remedial activities. At each meeting Tetra Tech presented an overview of the project, the planned activities, and the projected schedule. Questions from the stakeholders were answered by Wyoming DEQ, Tetra Tech, and Fuel Management Solutions.

The first stakeholder meeting was for the property owner (City of Casper) and right-of-way occupants (Source Gas and Century Link). No representatives from Century Link participated in the meeting. During this meeting, the City of Casper requested that the Site perimeter and road closure be modified to allow the Rails to Trails pathway to remain open during the project. Also, Source Gas agreed to have a representative on-site during any work being conducted in proximity to the gas main.

The second stakeholder meeting invitees included adjacent and nearby property occupants, including Ashley Furniture, Bank of the West, Casper Dry Cleaners, Joshua's Storehouse, Keith Tyler, Lai Thai Restaurant, Lisa Burrridge Realty, Salvation Army, and 12-24 Club. Ashley Furniture, Bank of the West, Casper Dry Cleaners, Lisa Burrridge Realty, and the Salvation Army did not attend the meeting. The primary concerns expressed by stakeholders attending this meeting were street closure and disruption to customer parking. As a result of these discussions, modifications to the planned traffic flow and parking were made for the alleys and parking area at Joshua's Storehouse, Lisa Burrridge Real Estate, and the Salvation Army. Additionally, the Wyoming DEQ agreed to produce a pamphlet describing the project and providing traffic and parking information. The pamphlet was distributed by the area businesses to their patrons.

### **3.3.2 Public Outreach Meeting**

A public outreach meeting was held by Wyoming DEQ on Thursday, July 19, 2012, from 6:00 p.m. to 7:00 p.m. in the Crawford Room at the Natrona County Library. The public meeting was intended to communicate project remediation plans and solicit input from the community. The Wyoming DEQ published a public notice in the Casper Star Tribune to announce the public meeting. Outreach/educational materials developed by Tetra Tech for the public meeting consisted of a graphical poster and a project information brochure for public distribution. Wyoming DEQ also developed a FAQ sheet for the community that addressed general questions about the remediation project. These outreach materials are presented in Appendix III. No public comments on Site remediation activities were received at the meeting.

## **4.0 SITE PREPARATION**

### **4.1 Underground Utility Clearance**

Prior to commencement of Site remediation activities, the Wyoming One-Call System was contacted to locate and surface mark underground utilities that were present in the remedial area. The utility owners were notified in advance of the upcoming project work.

Utility color codes were used to identify the existing underground utilities in the remedial area in order to protect them from damage during excavation. The Wyoming One-Call system contacted the utility owners. Locates for underground utilities were performed by utility operators on July 30, 2012.

Subsurface utilities identified and marked included the Source Gas pipeline and tap on the west side, a north/south Century Link conduit on the east side, an east/west Century Link line, street lighting power lines, and a partially located sewer line on the west side. Huber Plumbing was contracted to complete locates for the Joshua's Storehouse service sewer line located along the west side of South Wolcott Street. In addition, the water service line to Joshua's Storehouse was previously marked circa 2009 by an independent locator and shown to enter the west side of the building outside of the remedial area.

After pavement removal activities were completed, the utility owners again marked the underground utilities prior to commencement of excavation activities.

All utility lines marked within the excavation area were properly protected at all times according to the utility owner's specifications. No excavation or backfilling activities were conducted within three feet of any utility lines without the presence of a utility representative and concurrence by Wyoming DEQ.

### **4.2 Site Security and Access Control**

Temporary construction fencing was installed around the perimeter of the Site with controlled ingress/egress points.

Appropriate on-site security and access control for the remediation project area was necessary to protect the public from potential risks from excavation and remediation activities, to limit exposure from the acidic waste/soil, and to protect equipment against vandalism. During remediation activities, the Site was secured to provide protection and safety of on-site personnel and equipment and to prevent unauthorized access. Temporary security fencing was installed and remained in place until the remediation activities were concluded and the Site was transferred back to the City of Casper's control.

For the duration of the project activities, entrance to the remedial Site was closed to all public vehicular and pedestrian traffic. Site access was limited to authorized personnel and construction vehicles/equipment during remediation activities until the Site was closed and transferred back to the City of Casper's control and management at the close of business on September 21, 2012. A sign-in log was maintained at the Site access points for documentation of all non-construction personnel allowed entrance to the Site.

On-site security and access control was established by secure fencing around the project area and locked access points. A temporary seven-foot chain link fence was installed around the perimeter of the entire project area with two access gates secured with a hardened chain and combination code lock. The security fence encompassed the exclusion zone, loading and unloading area, and the support zone.

Two designated Site entrance/exit points to the project area were controlled by locked gates, one at the north side for truck and equipment ingress/egress and one on the west side for access to the support zone.

The truck and equipment entry/exit was located at the north end of the closed portion of South Wolcott Street. Construction trucks/equipment accessed the gated entrance/exit from the intersection of South Wolcott Street and Midwest Avenue and crossed the Rails to Trails pathway adjacent to the project site. All construction trucks/equipment entering the work area were required to be equipped with proper safety functions (i.e., lights, beacons, backup alarms). In addition, traffic spotters were utilized to alert drivers to pedestrian/bicycle traffic using the Rails to Trails pathway and to assist work vehicles/equipment to safely enter and exit the project work area.

A second entry/exit point was located along the fence on the west side of the support zone. The project support zone was established in the parking area immediately adjacent to Joshua's Storehouse. Security fencing and a locked gate controlled entry/exit to the support zone. The support zone contained a construction trailer, eye wash station, portable sanitation facilities, and equipment and materials storage areas.

Access to the exclusion zone was controlled by Tetra Tech. In addition to the requirements for visitors to sign in/out when entering the Site, all workers/visitors entering the exclusion zone were required to be informed of the site-specific HASP.

Because of the hazards related to heavy equipment operations within the congested work area and in accordance with the Site-specific Health and Safety Plan (HASP), all visitors (non-construction personnel) were escorted on-site by the Tetra Tech Site safety coordinator.

### **4.3 Traffic and Pedestrian Controls**

Keyhole Technologies, LLC (Keyhole), subcontracted by FMS, submitted a traffic control plan to the City of Casper Engineer's office for approval prior to project startup. Keyhole's traffic control plan included temporary closure of a portion of South Wolcott Street between Rails to Trails and East Collins Drive, restricted street access from the intersection of Midwest Avenue and Wolcott Street to Rails to Trails, and traffic redirection around the remedial project site and local business access. Access to local businesses and pedestrian use of the Rails to Trails pathway was preserved for the duration of the project.

Keyhole completed installation of traffic and pedestrian controls on July 30, 2012. All necessary traffic and pedestrian controls were maintained by Keyhole throughout the project duration in accordance with the City of Casper Standard specifications for Public Works and the approved traffic plan.

All traffic control devices installed and used by Keyhole conformed to the latest edition of the *"Manual on Uniform Traffic Control Devices"* (MUTCD). MUTCD-compliant portable traffic

control devices, including barricades, barrels, tubular markers, construction area signs, and other devices, were utilized as necessary to close, restrict, or delineate the right-of-way and to maintain safe road traffic flow. Figure 3 provides a diagram of the traffic and pedestrian controls that were in place for the duration of the project.

Keyhole maintained all traffic and pedestrian controls throughout project duration until Wyoming DEQ transferred control of the Site back to City of Casper at close of business on September 21, 2012. All traffic controls were removed on September 21, 2012.

In addition, a truck route was established for transporting excavated material off-site and for hauling imported material on-site. The truck haul route is shown on Figure 4.

## 4.4 Coordination and Permitting

Prior to commencement of the remedial activities, applicable permits and approvals were obtained, truck haul routes from the Site to the Casper Landfill were coordinated with the City of Casper, traffic and pedestrian controls were installed, subsurface utilities were located and marked, and temporary security fencing was erected around the Site.

Project permits obtained by Tetra Tech's construction subcontractor, FMS, included:

- City of Casper Permit to Close or Restrict Streets;
- City of Casper Street Cut Permit; and
- City of Casper Traffic Control Permit.

The installation of the security fence blocked the use of Joshua's Storehouse front door. Tetra Tech contacted the Casper Fire Department on August 1, 2012, to determine if blocking the exit complied with City of Casper Fire Code. Mr. David Lundahl of the Casper Fire Department arrived at the Site on August 2, 2012, and inspected Joshua's Storehouse fire egress. He stated that blocking the front door of Joshua's Storehouse during remedial activities was acceptable under the City of Casper Fire Code.

Tetra Tech communicated with the City of Casper Regional Landfill in June 2012 to obtain permission to dispose of the treated waste/soil and determine the sampling requirements to facilitate disposal. Tetra Tech also submitted to the landfill the analytical results from the pilot test conducted in April 2012. On June 6, 2012, Cindie Langston with the City of Casper Regional Landfill informed Tetra Tech that, based on the pilot test analytical results, the material would be accepted for disposal and no other analytical data was required except for pH measurements to document the waste/soil pH was greater than 5 s.u. and less than 9 s.u. Ms. Langston stated that there was no disposal limit for total petroleum hydrocarbons DRO but if the concentration was greater than 2,300 mg/kg a disposal surcharge would be required.

Photo-documentation of the existing pre-construction Site conditions was conducted on July 30, 2012 (Appendix I). In addition, a preliminary assessment of observable pre-construction structural damage, such as wall cracks or evidence of settling, was conducted at the Joshua's Storehouse building on July 30, 2012.

## **5.0 REMEDY IMPLEMENTATION**

### **5.1 Mobilization and Site Set-Up**

Field mobilization and Site preparation was conducted in advance of excavation and remediation activities.

The exclusion zone incorporated the entire remedial area, including areas of excavation, treatment, and temporary staging (stockpile areas). The truck loading/unloading area was located at the north end of the remedial area. Security fencing and a locked gate controlled entry and exit to the truck loading/unloading area. The support zone was located in the parking area immediately adjacent to Joshua's Storehouse. The support zone contained a construction trailer, eye wash station, portable sanitation facilities, and equipment and materials storage areas. Security fencing and a locked gate controlled entry and exit to the support zone.

### **5.2 Pavement Removal**

Street pavement was removed from the remedial area to expose the acidic waste/soil for remediation. Pavement removal began on August 1, 2012, and concluded on August 3, 2012. The areal extent of pavement removal covered approximately 9,300 square feet of South Wolcott Street. Source Gas and Century Link were the only utility owners who marked utilities in the excavation area. The pavement at the Site was observed to generally consist of approximately 12 inches of asphalt underlain by approximately six inches of concrete with paving fabric separating the asphalt and concrete.

Saw cuts, which were previously marked by Tetra Tech on July 31, 2012, were made across the street at the north and south ends of the defined remedial area. The street was scraped with a skid loader to remove the visible tar-like seep material from the road surface prior to pavement removal. The removed seep material was stored in on-site containment along with other impacted miscellaneous debris removed from the excavation. The containment waste was packed by PSC and transported to a designated facility for final disposal.

Monitoring well MW-5, which was installed during previous site characterization activities and located within the remedial area, was abandoned on August 1, 2012. Tetra Tech abandoned the well by placing 3/8-inch coated bentonite tablets to above the screened interval. The remainder of the casing was filled with granular bentonite to the surface. Coated bentonite tablets and granular bentonite were placed dry to prevent bridging.

Asphalt and concrete removal was performed by FMS subcontractor Wayne Coleman Construction Inc. using an excavator. The excavated asphalt and concrete pavement was loaded in dump trucks and transported to Wayne Coleman Construction located at 1898 Melodi Lane, Casper, Wyoming, where it was to be crushed and sold as recycled paving material.

Railroad ties were exposed during pavement removal activities on the south end of the remedial excavation area. Upon closer inspection, rail was observed still attached to the railroad ties. After reviewing Sanborn® Maps, it was determined that the railroad ties and rail were part of an old railroad siding shown on the Sanborn® Maps paralleling the north side of East Collins Drive.

During pavement removal activities, large patches of acidic seep material were observed in several areas directly beneath the pavement. In some cases, the seep material appeared to flow into low spots in the remedial area. One significant seep, which released greater than one-half gallon of acid, emerged in a “pool” along the west boundary of the remedial area and appeared to migrate from beneath the parking area immediately south of Joshua’s Storehouse. In other portions of the remedial area, the seep material appeared to follow the buried utility lines.



Acidic seep south of Joshua’s

After the pavement was removed, Tetra Tech performed a walking visual survey of the exposed surface and documented areas of more intense waste expression on the surface. The most common form of surface expression was the black tarry acidic hydrocarbon waste, as observed on the street prior to pavement removal. However, in some areas a clear liquid was observed. Litmus paper was used to evaluate the pH of these liquids, which indicated a pH of approximately 1 s.u. The liquid was assumed to be sulfuric acid, based on field observations and previous analytical testing of the seep material. The greatest occurrence of seeping acid was observed under the sidewalk near the southeast corner of Joshua’s Storehouse above the two-inch natural gas service line.

Source Gas and Century Link re-marked their utility lines after the pavement removal was completed and prior to the commencement of remedial excavation activities. In order to protect the buried utility lines, potholes were hand dug to determine the exact location and depth of the Source Gas service line tap and the Century Link fiber optic conduit. Potholing was conducted under the supervision of the respective utility owners.

### 5.3 Excavation

Acidic waste/soil excavation of the remedial area commenced on August 6, 2012, and was completed on August 28, 2012. Excavation activities were performed by Tetra Tech’s prime subcontractor, FMS, which were continuously observed by the Wyoming DEQ project manager or designated representative and the on-site Tetra Tech environmental scientist. The majority of the excavation was accomplished using a CAT 120 excavator and a skid steer. Acidic waste/soil adjacent to the Source Gas main and service line was removed with a John Deere mini excavator and by digging with hand tools.

The remedial work area only allowed working space for approximately 45 cubic yards of acidic waste/soil to be loaded into the treatment area. Therefore excavation was generally accomplished in roughly 45 cubic yard increments. A total of approximately 835 cubic yards of acidic waste/soil were excavated from the remedial area, of which approximately 805 cubic yards were treated and transported for disposal to the Casper Regional Landfill. Approximately 30 cubic yards of excavated material was non-impacted native soil, which was segregated for subsequent use as backfill material.

The excavation progressed downward until waste/soil was no longer observed and/or until in situ pH readings were within the target range. The excavation began at the south end of the remedial area near East Collins Drive and generally progressed to the north. The area between the north-south oriented Century Link communications line and the Source Gas main to just south of the east-west oriented Century Link fiber optics line was excavated first. Next, acidic

waste/soil located above the north-south oriented Century Link fiber optics line was excavated. The excavation progressed to the northern portion of the Site, and subsequently acidic waste/soil more than one foot above the east-west oriented Century Link line was removed. Lastly waste/soil near the Source Gas main was excavated, excluding acidic waste/soil located within three feet of the east-west oriented Century Link communications line.

The lateral extent of the acidic waste/soil excavated extended across most of the planned remedial excavation area. Additionally, acidic waste/soil was left in place in portions of the east, south, and west sidewalls, as discussed in Section 5.5 below. Figure 2 shows the lateral limits of the excavation and the acidic waste/soil left in place. The depth of excavation required to adequately remove the acidic waste/soil was generally zero to four feet excluding the area adjacent to the gas main, where excavation depths were up to six feet.

### **5.3.1 Century Link Line**

Wyoming DEQ provided written authorization to proceed with limited excavation of acidic waste/soil adjacent to the buried Century Link lines on August 14, 2012 (Appendix IV).

There were two distinct Century Link lines on the Site, one line traversed the Site north-south and one east-west. The north-south line was present approximately two and one-half feet below surface and was constructed of clay tile with a concrete cap poured over the top of the line. As directed by the Wyoming DEQ and in concurrence with Century Link, acidic waste/soil was excavated from the ground surface to the top of the north-south Century Link line on August 15, 2012. Excavation did not expose the sides of the north-south Century Link line. Excavation progressed from south to north utilizing the Cat 120 excavator and hand tools. All excavation activities were overseen by Steve Hebbert of Century Link. Mr. Hebbert confirmed that remedial excavation activities did not damage the Century Link line.

The east-west Century Link line was comprised of a four-inch diameter PVC conduit with a communications line also present along the outside of the PVC conduit. The east-west Century Link line was present approximately three feet below surface. Initially, Wyoming DEQ decided that excavation should not occur within three feet of the east-west Century Link line. However, after excavating the adjacent area north and south of the east-west Century Link line, a wooden bridge like structure was discovered just beneath the surface with abundant acidic seep material observed below the structure. Wyoming DEQ concluded that excavation should proceed from ground surface to one vertical foot above the east-west Century Link line in order to remove the highly impacted waste/soil and wooden structure. Excavation of material overlying the east-west Century Link line was completed on August 21, 2012. The excavation was overseen by Steve Hebbert, who stated there was no damage to the Century Link line during remedial excavation.



Seep material from sidewall on south side of east-west Century Link line

### **5.3.2 Source Gas Main**

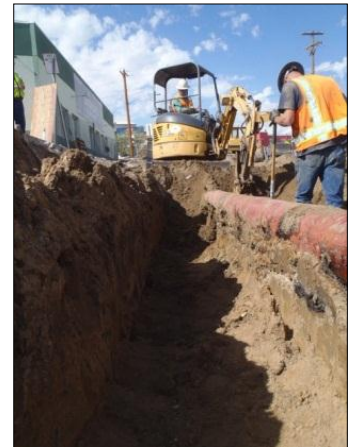
Wyoming DEQ provided written authorization to proceed with excavation of acidic waste/soil along the length of the Source Gas main and service line on August 28, 2012 (Appendix IV).

Excavation of the waste/soil overlying and adjacent to the Source Gas main and service line, located along the west side of the remedial area, began on August 22, 2012, and was completed on August 28, 2012.

Approximately 668 square feet of sidewalk and 126 linear feet of curb and gutter were removed during excavation of the area around the Source Gas lines. Excavation was accomplished using the Cat 120 excavator, a John Deere mini-excavator, and hand tools. All excavation activities were overseen by Walt Berens of Source Gas.

During excavation, seep waste material was observed in contact with the Source Gas main along most of the length of exposed Source Gas main located south of the east-west Century Link line. The waste material was observed primarily along the bottom and in some portions along the sides and top of the Source Gas main. There was limited seep material observed to be in contact the Source Gas main north of the east-west Century Link line.

It was necessary to undermine the Source Gas main for the entire exposed length in order to provide access for Source Gas to remove waste residue from the surface of the pipe and install a protective wrapping. The photograph at right shows seep material adhering to and below the Source Gas main during excavation of the acidic waste/soil above and adjacent to the pipe line.



Seep material on and below Source Gas main

During excavation, wooden cribbing was installed to temporarily support the Source Gas main until backfill could be placed around the pipe. The Source Gas main was not exposed within three horizontal feet of the east-west Century Link line in accordance with direction from Wyoming DEQ. It is unknown if the six feet of Source Gas main adjacent to the east-west Century Link line has been impacted by waste or during installation of the east-west Century Link line. Source Gas confirmed there was no damage to the Source Gas main or service line during remedial activities.

## 5.4 Unforeseen Conditions

Multiple unforeseen conditions were encountered and addressed during remedial activities, as discussed below.

1. During pavement removal activities on August 1, 2012, railroad ties from an old railroad siding were discovered paralleling the south edge of the remedial area. The northern rail of railroad track was observed in the south sidewall of the remedial area. The railroad siding was depicted on historical Sanborn® Maps from the early 1900's. Acidic waste/soil was observed beneath the railroad siding in the eastern portion of the southern excavation wall. After consulting with the City of Casper City Engineer, Mr. Andrew Beamer, the Wyoming DEQ elected to leave the railroad siding and the acidic waste/soil in place and no further excavation beyond the south boundary of the remedial area was performed.



Exposed rail, 12 in. depth

2. On August 16, 2012, during excavation and treatment of acidic waste/soil overlying the north-south Century Link fiber optics line, a single bone was discovered in the on-site treatment area. Upon discovery, work in the area where the bone was presumed to have been located was stopped immediately and the on-site Wyoming DEQ representative was notified.

Wyoming DEQ contacted local law enforcement and suspended all work at the Site until law enforcement had evaluated the nature of the bone. A member of the City of Casper Police Department and a Natrona County Coroner's office representative arrived at the Site to examine the bone and the area where it was discovered. The Coroner's office collected the bone and determined that it was not a human bone. With Wyoming DEQ permission, remedial activities then resumed.



Bone found in treatment area

3. There was insufficient information available regarding the east-west Century Link fiber optics line. Tetra Tech consulted with the Century Link contracted locators and Century Link staff to obtain additional information in order to avoid contacting the fiber optics line during excavation activities. On August 14, 2012, a pothole was excavated under the direction of Century Link to visually ascertain the depth and construction details of their east-west line. The line was encountered approximately three feet below grade and appeared to be a four-inch diameter PVC conduit. In addition, an exposed communications line was observed in the pothole along the outside of the four-inch diameter PVC conduit. Waste was observed close to the surface along the east-west Century Link line.

On August 24, 2012, during excavation to expose the Source Gas main, the east-west Century Link line was observed to lie within three inches or less above the gas pipeline. Due to logistical and safety concerns, and other mitigating factors, Wyoming DEQ directed excavation to not continue in this immediate area.

4. On August 22, 2012, a wooden conveyance (raceway) containing oily sediment was discovered protruding from the west sidewall of the remedial area near the southeast corner of Joshua's Storehouse. The conveyance was assumed to be a remnant of the former Lobell Refinery. The contents of the conveyance were collected and stored in a 55-gallon drum and the wooden structure was excavated for disposal. Samples were collected and delivered to Pace Analytical Services for analyses to determine if the oily material was a characteristic hazardous waste. Analytical results indicated the material was not a characteristic hazardous waste. The laboratory report is provided in Appendix V. The oily sediment was transported to the Casper Regional Landfill for disposal as petroleum contaminated soil (PCS).



Wooden Raceway

5. On August 23, 2012, an unidentified two-inch diameter steel pipe of unknown origin was discovered just below the Source Gas pipe line in the west sidewall of the remedial area. Source Gas speculated the line was an abandoned gas line and recommended it be left in place. Wyoming DEQ concurred with the Source Gas recommendation and the pipe line was left in place.

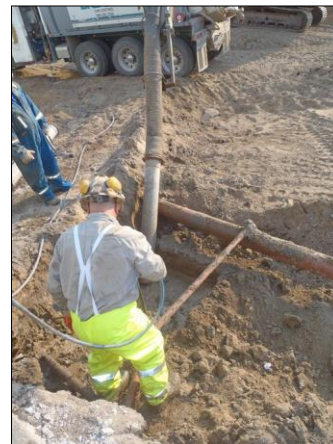
6. On the morning of August 24, 2012, Joshua's Storehouse reported that green water was observed coming from their faucets. Upon examination, the water appeared as an opaque green sediment-laden liquid. Tetra Tech consulted with the City of Casper to determine the source of the green water and sediment. City of Casper personnel stated that the green sediment-laden water appeared to be typical of scale that had dislodged from a copper water service line.

The water service line to Joshua's Storehouse was previously marked in 2009 by a private locator and shown to enter the west side of the building outside of the remedial area. The City of Casper arrived at the Site on the afternoon of August 24, 2012, and attempted to locate the water service line extending from the water main at East Collins Drive to Joshua's Storehouse, but was unable to conclusively determine the line location. The City of Casper provided an alternate source of municipal water to supply Joshua's Storehouse by running a hose from a different main and connecting through an outside faucet.

During excavation of the area beneath the sidewalk in front of Joshua's Storehouse on August 23, 2012, an unknown copper line was observed in the west sidewall near the Source Gas service line. On August 24, 2012, during excavation of the west sidewall adjacent to Joshua's Storehouse, the copper line was inadvertently "hooked" by the excavator and pulled partially out of the ground. On August 27, 2012, FMS cut the copper line in order to remove it from the work area. Unexpectedly, pressurized water released from the copper line when it was cut, which demonstrated the unknown copper line was the water service line for Joshua's Storehouse and the apparent source of the green water. The City of Casper was contacted and shut off the water supply at the street.

Wyoming DEQ decided to replace a portion of the water service line to Joshua's Storehouse. Because part of the water service line was located in an area where waste was to be left in place, Wyoming DEQ and the City of Casper required the replacement water service line to be installed inside a plastic conduit where the new service line entered Joshua's Storehouse.

The replacement water service line extended from the southeast corner of the building to the south side of the east-west Century Link line where waste was left in place. Wyoming DEQ required that excavation not be conducted within one vertical foot above and three horizontal feet on each side of the east-west Century Link line. Therefore, Badger Daylighting was contracted to hydrovac a hole for the water line approximately three feet below the east-west Century Link line. Huber Plumbing was contracted to install the sleeved water service line from the existing service line to Joshua's Storehouse utilizing the hole completed by Badger Daylighting. The hydrovacating and installation of the new portion of the water service line were completed on August 30, 2012. The installation of the replacement water service line was approved by City of Casper inspector Mr. Jim Bowden on August 30, 2012.



Hydrovacating hole for  
waterline installation

7. On August 28, 2012, a wooden box-like structure containing acidic oily waste material (not seep material) was discovered beneath the sidewalk in front of Joshua's Storehouse. The acidic oily material was transferred to 5-gallon plastic pails and placed in on-site containment for subsequent disposal.

8. On August 28, 2012, two manifolded metal pipes approximately two inches in diameter were discovered below the sidewalk in front of Joshua's Storehouse. The pipes extended under the sidewalk towards Joshua's Storehouse. Per Wyoming DEQ direction, the manifolded pipes were capped and left in place.



Manifolded metal pipes

## 5.5 Impacted Material Remaining in Place

Excavation of acidic waste/soil was limited to the remedial area defined by Wyoming DEQ. Under the direction of Wyoming DEQ, impacted acidic waste/soil was left in place within the final excavation. The location of these areas are depicted on **Figure 2** and described below.

- West sidewalk – Acidic waste/soil was observed in the sidewalk along the northern 110 feet adjacent to Joshua's Storehouse sidewalk. Confirmation sample analytical results from the excavation for sample # CS-14 shows TPH-DRO concentration of 8,060 mg/kg and pH 7.9 s.u. Sample # CS-15 shows TPH-DRO concentration of 18,200 mg/kg and pH 7.9 in the soil.

Comment: The lateral extent of the observed acidic waste/soil north of the east-west Century Link line could not be determined without compromising the structural integrity of Joshua's Storehouse. In the southern area of the west sidewalk, there was no surface expression of seeps observed on the sidewalk prior to excavation activities.

- East sidewalk – Acidic waste/soil was observed along the sidewalk in the first 15 feet north of the east-west oriented Century Link line. Confirmation sample analytical results for sample # CS-12 shows TPH-DRO concentration of 13,400 mg/kg and pH 7.2 s.u. in the soil.

Comment: Active waste seepage was observed emerging from the east sidewalk. However, no surface seeps were observed on the sidewalk prior to excavation activities.

- East sidewalk – Acidic waste/soil was observed along the sidewalk in the southern 65 feet. Confirmation sample analytical results from the excavation for sample # CS-09 shows TPH-DRO concentration of 36,600 mg/kg and pH 4.7 s.u. in the soil.

Comment: Upon removal of the overlying confining pavement and soil, active waste seepage was observed emerging from the east sidewalk. The acidic waste seepage appeared more active due to the warmer summer temperatures. However, no surface seeps were observed in the sidewalk prior to excavation activities.

- South sidewalk – Acidic waste/soil was observed along the sidewalk beneath the old railroad siding in the eastern 40 feet. Seep material was present in the southeast corner and black staining beneath the railroad tracks.

Comment: Further excavation towards the south would likely have required closure of the intersection of South Wolcott Street and East Collins Drive.

- Floor – Acidic impacted soil was detected in the center of the remedial excavation south of east-west oriented Century Link line. Confirmation sample analytical results for sample # CS-3 shows pH 4.1 s.u. and TPH-DRO concentration of 11.9 mg/kg in the soil.

Comment: No visible waste was observed at this location.

- Floor – Acidic impacted soil was detected in the east central remedial excavation south of the east-west Century Link line. Confirmation sample analytical results from sample # CS-4 showed pH 4.0 s.u. and TPH-DRO concentration of 1,700 mg/kg in the soil. The pH was outside the target pH range of 5 to 9 s.u.

Comment: No visible waste was observed at this location.

- Floor – Impacted soil was detected in the east central portion of the remedial excavation north of east-west Century Link line. Confirmation sample analytical results from sample # CS-8 shows TPH-DRO concentration of 3,620 mg/kg and pH 7.7 s.u. in the soil.

Comment: Discoloration was observed in the soil.

- East-west Century Link Line – Acidic waste/soil was left in place one vertical foot above the Century Link line location and three feet on each side. Acidic waste/soil was observed across the entire length of the line location.

The acidic waste/soil left in place in the remedial excavation represents an unknown lateral extent in the areas adjacent to these locations. Figure 2 shows the lateral limits of the excavation and the acidic waste/soil left in place. The table below provides a summary of the confirmation results showing exceedances of the Wyoming DEQ clean-up criteria.

### Summary of Exceedances – Confirmation Sample Analyses

Location	Floor/Sidewall	TPH-DRO Concentration (mg/kg)	pH (s.u.)
CS-3	Floor	11.9	4.1
CS-4	Floor	1,700	4.0
CS-8	Floor	3,620	7.7
CS-9	East Sidewall	36,600	4.7
CS-12	East Sidewall	13,400	7.2
CS-14	West Sidewall	8,060	7.9
CS-15	West Sidewall	18,200	7.9

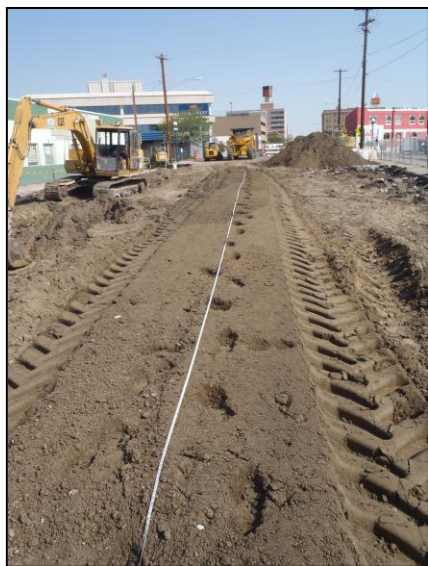
## 5.6 On-Site Treatment

In accordance with the remedy selected by the Wyoming DEQ, remediation of the excavated acidic waste/soil consisted of on-site pH neutralization and mixing followed by final off-site disposal of the treated waste at the Casper Regional Landfill as petroleum contaminated soil (PCS).

The acceptance criteria for disposal at the Casper Regional Landfill as PCS required the pH range of the treated waste to be greater than 5.0 s.u and less than 9.0 s.u. The Casper Regional Landfill agreed to accept documentation from the pilot test conducted in April 2012 that demonstrated the pH of the acidic waste/soil after neutralization treatment with CKD is greater than 5.0 s.u and less than 9.0 s.u. Further, the Casper Landfill deemed documentation of the following laboratory analytical results from the pilot test as sufficient evidence that the treated waste/soil meets their disposal requirements:

- TPH-DRO: Detections ranged from 15,000 to 24,700 mg/kg
- TPH-GRO: Not analyzed because previous studies indicate only heavier hydrocarbons are present in the waste
- TCLP RCRA Metals: Only barium was detected (0.29 to 0.38 mg/L)

The laboratory documentation was accepted by the Casper Regional Landfill and no further analyses were required for disposal of the treated waste/soil. In order to account for potential of pH rebound or over/under pH correction during treatment, the conservative on-site treatment goal for acidic waste/soil neutralization was between pH 6.0 and 8.0 s.u.



On-Site Treatment Area

The on-site treatment process consisted of the addition of a measured volume of cement kiln dust (CKD) to the excavated acidic waste/soil placed in the treatment area, followed by mixing with a CAT RM-500 Rotary Mixer (Reclaimer) to ensure the acidic soil/waste was sufficiently blended with the pH neutralizing agent.

The acidic waste/soil from the remedial area was excavated and placed in a temporary stockpile for subsequent treatment. The linear on-site treatment area was located in a prepared portion of the unexcavated remedial area, which varied in location as excavation progressed. Approximately 45 cubic yards of the excavated acidic waste/soil was transferred from the temporary stockpile with a backhoe and loaded onto the treatment area for mixing and neutralization. The volume of the acidic waste/soil transferred to the treatment area was approximated by counting the number of excavator buckets. The excavator bucket was estimated to hold approximately one cubic yard of waste/soil.

After loading and prior to neutralization, the Reclaimer passed over the treatment area to reduce the particle size, mix, and homogenize the acidic waste/soil to a more uniform mixture. After the waste soil was sufficiently mixed and homogenized, pH measurements were collected at staggered five foot intervals along the length of the treatment area. The pH measurements were

recorded and the average pH of the mixed waste/soil was calculated using the statistical trimmed means method of averaging to reduce the effects of outlier bias in the pH data set.

Based on information derived from the pilot test for the neutralization of the acidic waste/soil using CKD, the calculated pH average of the waste/soil in the treatment area was used to help determine the volumetric application of CKD required for neutralizing the acidic waste/soil within the targeted pH range.

The appropriate volume of CKD was evenly applied by hand to the surface of the acidic waste/soil in the treatment area. Over the course of the project, an average of approximately 0.6% of CKD by volume was required to adequately neutralize the waste/soil.

The Reclaimer again passed over the treatment area until the CKD was sufficiently mixed with the waste/soil. The pH measurements were then repeated across the treatment bed at staggered five foot intervals and the data were recorded. Once again, the trimmed means average of the pH from the data set was calculated.



CKD application to on-site treatment area

If needed, additional treatment was performed by supplemental addition of CKD followed by blending and subsequent field pH measurements as described above. After the target pH range of 6.0 – 8.0 s.u. was achieved, the treated material was stockpiled for subsequent loading and transport to the Casper Regional Landfill for final disposal as PCS.

The last treatment area located within the remedial area was excavated. This area was excavated and segregated in the same manner described above and treated in a final relocated treatment area. After treatment was complete, the waste/soil underlying the final treatment area was excavated to a depth of six inches and transported to the Casper Landfill for final disposal. This action ensured any residual waste material that may have mixed into the underlying soil beneath the final treatment area was excavated and removed from the Site.

The total treated waste/soil transported to the Casper Regional Landfill for final disposal was approximately 810 cubic yards. The 810 cubic yards included a total of approximately 5 cubic yards of CKD applied to the waste/soil for neutralization during remedial treatment.

## 5.7 Monitoring and Control

### 5.7.1 Fugitive Dust Monitoring

Reasonable precautions necessary to control fugitive dust emissions were implemented during excavation, remediation, stockpiling, loading, and transportation activities.

To ensure that on-site fugitive dust emissions were controlled, dust monitoring was continually performed during work hours at the Site. Two electronic DustTrak™ II Aerosol Monitor 8530

dust monitors were installed along the fence line, one upwind and one at a downwind position. These electronic dust monitors were used to measure the dust levels during project activities. The DustTrak™ II Aerosol Monitor 8530 is a battery-operated, data-logging, light-scattering laser photometer that provides real-time aerosol mass readings with an aerosol concentration range of 0.001 to 400 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ). Dust levels measured during project activities remained below the OSHA permissible exposure limit of  $15 \text{ mg}/\text{m}^3$  of total dust. The maximum aerosol detection was  $6.4 \text{ mg}/\text{m}^3$ , which occurred on August 21, 2012, at the downwind monitoring station.

In accordance with the requirements under Wyoming DEQ Air Quality Division's (AQD) Standards and Regulations Chapter 3, Section 2, Paragraph (f), appropriate dust control measures were implemented at the Site to mitigate dust exposure to on-site workers and off-site migration to the community. The following dust mitigation measures were implemented during project activities.

- For fugitive dust resulting from project construction activities, dust generation was controlled by watering utilizing a garden hose and sprayer as needed during excavation activities.
- Water application was also used to remove material from the pavement at the truck loading area to minimize fugitive dust and off-site tracking.
- Waste/soil loaded in the treatment zone was covered with a tarp when airborne dust was observed and at the end of each work day.
- Loaded trucks leaving the Site were covered to prevent dust generation.



Covered treatment area, end of day



Loaded truck covered for transport  
to Casper Landfill

### 5.7.2 Gas Monitoring

Gas monitoring was performed using a VRAE 4gas+  $\text{SO}_2$  meter during project activities. This unit measures carbon monoxide (CO), hydrogen sulfide ( $\text{H}_2\text{S}$ ), oxygen, lower explosive limit (LEL), and sulfur dioxide ( $\text{SO}_2$ ). Gas monitoring was performed in the excavation during and immediately after excavation of new areas and while mixing acidic waste/soil in the treatment area using the Reclaimer.

Gas readings in the work zone were below short term exposure limits (STELs) for the gases monitored. One reading on August 7, 2012, of 7 parts per million  $\text{H}_2\text{S}$  resulted from placing the monitor immediately adjacent to newly exposed acidic waste in the southern portion of the

excavation. H<sub>2</sub>S concentrations of 5 parts per million or above were not detected in the work area.

### 5.7.3 Noise

All equipment was maintained in proper condition with exhaust controls to minimize noise levels. Equipment operation only occurred between 7 a.m. and 6 p.m. Monday through Friday. In accordance with Wyoming DEQ's Voluntary Remediation Program Green and Sustainable Remediation (GSR) Policy, vehicles and construction equipment used at the Site were properly maintained and heavy equipment was shut off when not in use for more than five minutes.

### 5.7.4 Storm Water Protection

Storm water controls were installed as necessary to prevent run-off from the Site during project activities. The following storm water run-off controls were implemented:

- Sandbags were installed around the storm sewer inlet located at South Wolcott Street and East Collins Drive on the south side immediately adjacent to the Site;
- The remedial treatment area was covered with tarps/plastic during a rain event and, if necessary, at the end of the work day;
- Site work activities were suspended for the duration of a rain event.

No storm water run-on or run-off was observed at the Site during active remediation activities.

Precipitation data obtained from the National Oceanic and Atmospheric Administration (NOAA) show Casper, Wyoming, received a total of 0.1 – 0.25 inches of precipitation during the month of August 2012.

## 5.8 Waste Transportation and Disposal

Excavated waste/soil was temporarily stockpiled after pH neutralization treatment and then loaded into 10 cubic yard end dump trucks for transport and disposal as petroleum contaminated soil (PCS) at the Casper Regional Landfill located at 1886 North Station Road, Casper, Wyoming. Each load was covered with a tarp to mitigate dust generation during transport.

A load ticket was provided by the Casper Regional Landfill to document the tonnage for each load hauled to the landfill for disposal. A total of 1,095.51 tons of waste/soil was transferred to the landfill for disposal. Copies of each load ticket are provided in Appendix VI.

Additionally, at the request of Wyoming DEQ, approximately two cubic yards of metal waste material and impacted miscellaneous debris excavated from the remedial area were transported for disposal at a hazardous waste landfill. The metal waste and impacted material was stored on-site in lined containment and consisted of various pipes containing acidic hydrocarbon waste, metal bands for wooden barrels, steel barrel bands, and other miscellaneous parts and metal fragments. The metal waste was packed and transported off-site by PSC on



Excavated metal waste in containment

September 20, 2012. PSC transported the packed waste to the designated facility, Clean Harbors of Eldorado, 309 American Circle, El Dorado, Arkansas, for final disposal. A copy of the manifest is included in Appendix VII.

## **5.9 Verification and Confirmation Sampling**

### **5.9.1 Verification Sampling**

In situ pH measurements using a hand-held Hanna 99121 or Spectrum FieldScout SoilStik direct read portable pH meter were collected across the treatment area at five-foot intervals for each batch of the mixed acidic waste/soil placed in the treatment unit. These measurements were used to determine the application rate of the cement kiln dust (CKD) needed to reduce the pH in the waste/soil to the target range of pH 6.0 to 8.0 standard units (s.u.). If the pH readings indicated the pH was out of the target range, the volume of CKD required was calculated and applied to the treated waste/soil. This step was subsequently repeated after each CKD application was blended until the target pH range of the treated waste/soil was achieved. The treated waste/soil was then stockpiled for subsequent transport to the Casper Regional Landfill for final disposal.

In accordance with the project Sampling and Analysis Plan (SAP), composited verification samples were collected for the treated waste/soil and submitted to Pace Analytical Services to provide documentation of the concentration of total petroleum hydrocarbon diesel range organics (TPH-DRO) and to verify the treated waste/soil passed the paint filter test for disposal at the Casper Regional Landfill.

Per project SAP requirements, verification samples were collected for laboratory analyses from the stockpiled treated waste/soil at the rate of one composite sample per every 250 cubic yards of treated waste/soil.

A total of four composited waste/soil verification samples were collected during the remediation project. One composite verification sample was collected from the first batch of treated soil prior to transport to the Casper Regional Landfill. Subsequent treated waste/soil samples were collected at a rate of one composite sample per 250 cubic yards.

The sampler used a dedicated pair of nitrile gloves while collecting aliquots from three locations on the treated waste/soil stockpile. The soil was homogenized in a zip-lock bag and placed directly into sample containers provided by the laboratory. Sample containers were labeled and placed into a cooler with cubed ice. Verification samples were either shipped to the laboratory the same day as collection or stored at 4° C in a refrigerator at Tetra Tech's Casper Office. Samples were shipped under chain of custody protocols via FedEx to Pace Analytical Services in Minnesota or Montana as directed by the laboratory.

Verification samples were analyzed for total petroleum hydrocarbon diesel range organics (TPH-DRO) and the paint filter test. Complete laboratory analytical reports are presented in Appendix V.

### **5.9.2 Confirmation Sampling**

Post-remediation confirmation sampling was conducted for the remedial excavation upon affirmation by Wyoming DEQ on August 29, 2012, that no further excavation or remediation at

the Site was required. Confirmation sampling of the remedial excavation was performed in general accordance with Wyoming DEQ Voluntary Remediation Program (VRP) Fact Sheet #10, Soil Confirmation Sampling Guidelines.

A total of eight floor and ten sidewall discrete soil samples were collected from the open excavation. Confirmation sample locations were recorded using a Trimble Geo XH GPS. Sampling locations are presented on Figure 5. Complete laboratory analytical reports are presented in Appendix V.

In conformance with the SAP, excavation soil samples were collected by using an excavator to remove the top six inches of soil at each confirmation floor sample location. The soil samples were collected from the excavator bucket from a position where the soil did not contact the bucket edge to ensure the samples were not cross contaminated. Sampling was witnessed by Mr. Jerry Breed, Wyoming DEQ, who stated he was satisfied with the collection methodology and practices.

Excavation confirmation sidewall samples were collected from four evenly distributed locations along both the east and west sidewalls and one sample each from the north and south sidewall edges of the excavation. Sidewall confirmation samples were collected using a shovel. The sampler was careful not to collect soil that had come into contact with the shovel.

The sampler used a new pair of nitrile gloves during collection of each confirmation sample. All samples were placed directly into laboratory-provided 4-ounce glass jars. After collection, each filled sample container was sealed, placed in a zip-lock bag, and placed in an iced cooler. Samples that were not shipped the same day as collection were stored at 4°C in a refrigerator at the Tetra Tech Casper Office. All confirmation samples were shipped under chain of custody protocols via FedEx to Pace Analytical Services in Minnesota or Montana as directed by the laboratory.

All excavation confirmation samples were analyzed for pH and TPH-DRO. Complete laboratory analytical reports are presented in Appendix V.

Excavation confirmation sample locations, pH results, and TPH-DRO concentrations are presented on Figure 5. The analytical results show three confirmation soil sample locations exhibited pH values below the Wyoming DEQ's clean-up goal of pH 5.0 s.u. Confirmation sample locations CS-3, CS-4, and CS-9 exhibited pH values of 4.1 s.u., 4.0 s.u., and 4.7 s.u., respectively.

In addition, analytical results indicated TPH-DRO concentrations in five confirmation sample locations were above Wyoming DEQ's clean-up goal of 2,300 mg/kg. One floor sample, confirmation sample location CS-8, and four sidewall samples, locations CS-9, CS-12, CS-14, and CS-15, indicated TPH-DRO concentrations ranged from 3,620 mg/kg to 36,600 mg/kg.

The analytical results from the confirmation samples, shown in the table below, were conveyed to Wyoming DEQ on September 9, 2012. Wyoming DEQ concluded that no further excavation or remediation was required in the excavation areas that indicated the pH and TPH-DRO concentration did not meet the clean-up goals. Wyoming DEQ's decision was based on logistical constraints, safety, and potential future impact considerations. Wyoming DEQ concluded that hydrocarbon and acid impacts from waste left in place is not expected to pose unacceptable future exposure risks to citizens or migration to groundwater issues.

### Confirmation Sample Analytical Results

Location	Floor/Sidewall	TPH-DRO Concentration (mg/kg)	pH (s.u.)
CS-1	Floor	Non-Detect	8.0
CS-2	Floor	16.3	8.0
<b>CS-3</b>	Floor	11.9	<b>4.1</b>
<b>CS-4</b>	Floor	1,700	<b>4.0</b>
CS-5	Floor	Non-Detect	8.3
CS-6	Floor	422	7.6
CS-7	Floor	Non-Detect	8.5
<b>CS-8</b>	Floor	<b>3,620</b>	7.7
<b>CS-9</b>	East Sidewall	<b>36,600</b>	<b>4.7</b>
CS-10	East Sidewall	85.2	9.2
CS-11	East Sidewall	443	8.4
<b>CS-12</b>	East Sidewall	<b>12,400</b>	7.2
CS-13	West Sidewall	138	8.1
<b>CS-14</b>	West Sidewall	<b>8,060</b>	7.9
<b>CS-15</b>	West Sidewall	<b>18,200</b>	7.9
CS-16	West Sidewall	20.3	7.9
CS-17	South Sidewall	241	7.0
CS-18	North Sidewall	798	8.1

## 6.0 SITE RESTORATION

A visual examination of the remedial excavation area was conducted on August 29, 2012, by Jerry Breed with Wyoming DEQ, Dorothy Hall and Joseph Scott of Tetra Tech, and FMS foreman Chad Federer, to determine if remedial excavation was completed in accordance with Wyoming DEQ requirements. Mr. Breed stated that no further remedial activities were required and Site restoration activities should begin.

Prior to commencement of Site restoration activities, the final excavation was mapped using a Trimble Geo XH GPS unit. The locations of Site features were documented and are presented on Figure 2. Features recorded included but are not limited to: waste left in place, utilities, horizontal limits of excavation, and confirmation sample locations.

All Site restoration activities were completed in accordance with the 2006 City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements. Site restoration was supervised by FMS and completed by their sub-contractors Wayne Coleman Construction Inc. and Ramshorn Construction Inc.

From September 5<sup>th</sup> through September 10<sup>th</sup>, Source Gas and their subcontractor, Brown Construction Inc., completed cleaning and wrapping of the Source Gas lines.

## **6.1 Excavation Backfilling**

Areas identified as non-impacted native soil during remediation activities were excavated from the remedial area and stockpiled in a designated area outside of the excavation area. A total of approximately 30 cubic yards of non-impacted native soil was segregated and stockpiled for future use. Non-impacted native soil was returned to the excavation during remediation for use as ramp material.

Backfilling activities began on September 10, 2012. Backfill material was comprised of recycled concrete provided by Wayne Coleman Construction. The recycled concrete complied with City of Casper specifications as demonstrated by testing previously completed by Tetra Tech and was approved by the City of Casper. Backfill materials were moisture conditioned to within plus or minus 2% of optimum moisture content using a water truck. Backfill materials were compacted to at least 95% of maximum dry density using a Sakai vibrating smooth drum roller.

Backfill was placed in six inch compacted lifts. Moisture and density testing, as described in Section 6.4, Construction Materials Testing, was performed for each lift placed within the excavation. All moisture and density tests passed specifications before additional fill was placed.

Due care was taken over the eastern-most portion of the Site where clay tile covering the Century Link line had been exposed. This area did not receive roller-compaction until it had been covered with at least 14 inches of backfill to prevent damage to the conduit.

## **6.2 Sidewalk/Gutter Replacement**

On the west edge of the Site, the Source Gas main and service line exposed during remediation was covered and surrounded by a cement-free slurry of sand and water (flow fill) supplied by Knife River Corporation. Once dry, the sand was capable of supporting the gas lines and did not require testing. A total of approximately 668 square feet of sidewalk and 126 linear feet of curb and gutter were replaced.

After the sand slurry had been completed to sidewalk subgrade elevation, Ramshorn Construction Inc. placed concrete for the new sidewalk in front of Joshua's Storehouse. The sidewalk was completed on September 17, 2012. Sidewalks and curb and gutter were constructed in accordance with City of Casper specifications. The curb and gutter was tested for slump, air content, and compressive strength. No gutter was present on the east side of the

street prior to remediation and, in compliance with City of Casper's instructions, no new gutter on the east side was added. Additionally street grade was modified to provide six inches of curb face for drainage.

### **6.3 Subgrade Preparation**

JKC Engineering was contracted to establish final subgrade elevations approved by the City of Casper, and to provide construction surveying services. A six inch layer of crushed concrete base course meeting the City of Casper specifications was placed and compacted. Prior to use of base course, material submittals from the supplier, Wayne Coleman Construction, were reviewed to ensure conformance with City of Casper specifications and approved by the City.

The Century Link manhole on the east side of the Site was modified and replaced during restoration to meet the final grade as requested by the City of Casper.

A proof roll and site walkthrough were overseen by the City of Casper and Tetra Tech prior to Site closure. One 30 foot by 30 foot area on the western portion of the Site did not pass the proof roll, which was reworked per the City of Casper request and subsequently approved.

### **6.4 Construction Materials Testing**

Tetra Tech performed laboratory and field construction materials testing of imported backfill, base course, and concrete to verify that the materials complied with City of Casper specifications. The laboratory and field reports of the testing described below are contained in Appendix VIII.

Laboratory testing included two standard Proctor tests (ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort) performed on the imported fill materials: one test was performed on the recycled concrete used as backfill and one test was performed on 100% recycled concrete grading W base course. These materials were also evaluated for gradation and Atterberg Limits. The results of the tests indicated the materials met City of Casper specifications.

The other laboratory tests included two concrete samples, one from each load of concrete, collected during concrete placement for the sidewalk, curb and gutter replacement on the west side of South Wolcott Street. Compressive strength test cylinders were cast to determine the 7 day and 28 day compressive strength of the concrete. The compressive strength for the first load was approximately 3,850 psi, which is 150 psi below the City of Casper specification of 4,000 psi. The second load of tested concrete was above the City of Casper specification with a compressive strength of approximately 5,740 psi.

Field testing of concrete included determination of slump, total air content, unit weight, and temperature. The fresh concrete properties for both loads of concrete met the City of Casper requirements.

During backfill placement and compaction activities, the backfill materials were moisture conditioned to within plus or minus 2% of optimum and were compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D698. The backfill materials were

placed in uniform lifts not exceeding eight inches loose thickness. A total of 24 in-place density and moisture tests were performed to ensure the backfill material was placed and compacted in accordance with City of Casper specifications. Seven of the density and moisture tests initially failed and the in-place backfill material was then reworked and tested again to verify proper compaction and adherence to City of Casper specifications. Additionally, five density and moisture tests were performed on the base course. All five tests met the City of Casper specifications.

All of the field and laboratory construction materials test results are presented in Appendix VIII.

## **7.0 SITE CLOSURE**

On September 19, 2012, Cindi Martinez, Wyoming DEQ, Andrew Beamer and Scott Baxter, City of Casper, Dorothy Hall, Tetra Tech, and Brad Nelson, FMS, conducted a Site walkthrough to identify any items that needed to be corrected. During the walkthrough, a final punch list was developed for deficient items and included dates for completion for each item. The punch list is attached as Appendix IX.

The following items were listed on the punch list and completed as indicated:

1. Remove all traffic control devices – completed 9/21/12
2. Remove all security fencing – completed 9/20/12
3. Remove PortaJohn – completed 9/19/12
4. Remove metal waste – completed 9/20/12
5. Plug fencing boreholes – completed 9/21/12
6. Reinstall Bus Stop sign – completed 9/21/12
7. Remove waste containment box – completed 9/20/12
8. Remove miscellaneous debris – completed 9/21/12

In correspondence dated September 19, 2012, Wyoming DEQ acknowledged final Site closure and transitioned control of the Site to the City of Casper effective by close of business on September 21, 2012.

## **8.0 CONCLUSIONS**

In accordance with Wyoming DEQ's stated goal, Site remediation was completed in a safe, responsible, and cost effective manner. Tetra Tech provided all labor, equipment, supplies, and material necessary to accomplish the project objectives.

Tetra Tech coordinated activities with Wyoming DEQ and stakeholders and developed the required project plans. A pilot test was performed to determine the most effective and economical neutralizing agent for full scale on-site remedial treatment.

Remedial on-site activities commenced on July 30, 2012, and final Site restoration was completed on September 19, 2012.

Approximately 9,300 square feet of asphalt/concrete road surface and 668 square feet of sidewalk were removed from the remedial area to expose the acidic waste/soil for excavation and subsequent treatment by neutralization.

An estimated total of 835 cubic yards of acidic waste/soil and native soil was excavated from the remedial area. Approximately 805 cubic yards of acidic waste/soil was successfully pH neutralized on-site and transported to the Casper Regional Landfill for final disposal as petroleum contaminated soil.

Tetra Tech and Wyoming DEQ successfully addressed and resolved multiple unforeseen conditions that occurred during remedial activities. In addition, acidic waste/soil was removed from the Source Gas and Century Link subsurface utility lines to the extent allowed by and to the satisfaction of the respective utility owners.

The Site remedial excavation was restored in accordance with the City of Casper specifications. The Site was closed and returned to the control and management of the City of Casper at close of business on September 21, 2012.

In the remedial areas excavated, the removal of the source of acidic hydrocarbon seep material effectively eliminated the surface exposure pathway and the subsequent potential public exposure to surface seeps.